

Air Emissions Reductions and Value from Green Power

By

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Washington, DC.

Air Emissions Benefits of Green Power

- GP produces no or low direct air emissions.
- GP is usually a must run source of power.
- It displaces other plants that vary their production to meet the demand.
- These “on demand plants” are mainly fossil fueled thermal plants with relatively high air emissions.
- Nuclear and hydro plants are not displaced by GP.

The Dispatch Order for Power Plants

Highest operating cost

- Natural Gas Simple Cycle Gas Turbines. (Peakers)
- Oil Fired Steam Turbines
- Natural Gas Fired Steam Turbines
- Natural Gas Combined Cycle Gas Turbines
- Coal Fired Steam Turbines
- Renewable Energy Sources (Green Power)
- Nuclear and hydro plants

Lowest operating cost

How do we calculate emissions reductions ?

- Obtain schedule of GP production - time of day / week / month
- Obtain list of conventional units on demand (operating on the margin) from load serving entity (utility).
- Verify the list of units on demand by reference to capacity factors, actual generation
- Determine demand schedule priority (back down order)

How do we calculate emissions reductions -- continued

- ◆ Obtain emissions data and generation data for displaced units from CEMs for the relevant time periods to calculate emissions/MWh
- ◆ Determine net reductions in emissions attributable to GP generation by time period.

Avoided Emission From Wind

- ◆ The avoided annual CO₂ emissions from a 100 MW wind project is equivalent to taking 34,000 cars off the road.

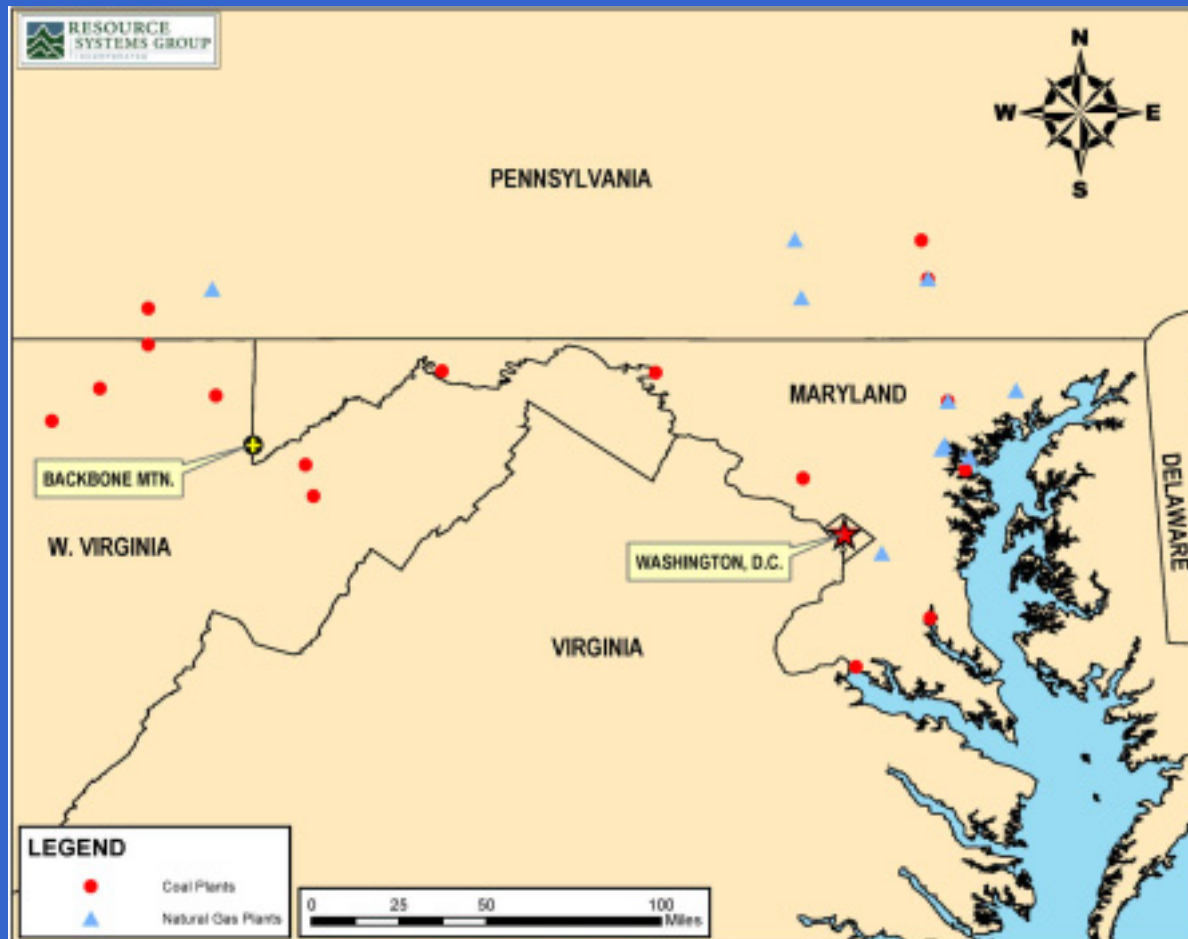
Washington DC Maryland Case Study

- ◆ Metropolitan Washington is non-attainment for Ozone
- ◆ MWCOG and Montgomery County are going to buy wind power to meet the NO_x SIP requirements of the Clean Air Act.
- ◆ They propose to use the NO_x reductions to meet the NO_x SIP call.
- ◆ This is cheaper than making reductions of NO_x emissions directly (E.g. car pool incentives, buying old cars)
- ◆ How can NO_x credit be obtained ?

Example of Verification Process

Displacement of on demand units by wind in Maryland
using proposed wind power in Garrett County,
Maryland on Backbone Mountain.

Map of MD Area Plants on Demand



Location of the plants with on demand units

MD Area Plants on Demand

Groupings		State	Plant Name	Plant Code (Orispl)	Primary Fuel	Nameplate Capacity (MW)
Maryland, Pennsylvania, and W. Virginia Group	Maryland Group	MD	Notch Cliff	1555	Natural Gas	144
		MD	Perryman	1556	Natural Gas	405
		MD	Riverside	1559	Natural Gas	244
		MD	Westport	1560	Natural Gas	122
		MD	Domino Sugar Corp	54795	Natural Gas	10
		MD	Panda Brandywine L P	54832	Natural Gas	289
		MD	Brandon Shores	602	Coal	1370
		MD	C P Crane	1552	Coal	416
		MD	H A Wagner	1554	Coal	1059
		MD	Chalk Point	1571	Coal	2647
		MD	Dickerson	1572	Coal	930
		MD	Morgantown	1573	Coal	1548
	PJM West - Coal Only Group	MD	R Paul Smith Power Station	1570	Coal	110
		MD	Aes Warrior Run	10678	Coal	229
		MD	Luke Mill	50282	Coal	65
	PJM West - Coal Only Group	WV	North Branch	7537	Coal	80
		WV	Albright	3942	Coal	178
		WV	Fort Martin	3943	Coal	1152
		WV	Harrison	3944	Coal	2052
		WV	Rivesville	3945	Coal	110
		WV	Mt Storm	3954	Coal	1681
		PA	Hatfield's Ferry	3179	Coal	1728
		PA	P H Glatfelter Co	50397	Coal	110
		PA	PPL Brunner Island	3140	Coal	1567
		PA	Hunterstown	3110	Natural Gas	58.8
		PA	Mountain	3111	Natural Gas	53.2
		PA	York Cogen Facility	54693	Natural Gas	69
		PA	Allegheny Energy Unit 8 & 9	55377	Natural Gas	88

MD Area on Demand Units Match Against Wind

Percentage of time that wind generation matches specific fuels
at units operating on the margin

Time Period	% Coal	% Natural Gas	% Wind Match
Mon-Sun 8hr /day (7x8 = 56hr)	80%	20%	35%
Sat-Sun 16hr/day (2x16 = 32 hr)	50%	50%	22%
Mon-Fri 16 hr/day (5x16 = 80 hr)	30%	70%	43%

Emissions Reductions

Displaced Emissions from wind power by plant group

Pollutant	MD Group	MD, PA, and WV Group	PJM West Coal Only Group
	lbs/MWh	lbs/MWh	lbs/MWh
CO₂	1329.08	1374.60	2113.18
NO_x	3.06	3.13	5.72
SO₂	8.34	8.83	17.66

Emissions Reductions

What is the value of the emissions reductions ?

NO_x \$3000 to \$10,000 /ton

SO₂ \$ 300 to 600 /ton

CO₂ \$ 3 to \$ 5 /ton

Most of these are likely to increase in the future

Renewable Energy Emissions Reductions

	Maryland West <i>PJM West Coal</i>	New England <i>Gas, Oil & Coal</i>	New York <i>Gas & Oil</i>
	lb/MWh	lb/MWh	lb/MWh
CO2	2113	1527	1270
NOx	5.7	2.6	1.4
SO2	17.7	6.7	1.8
	Value	Value	Value
	\$/MWh	\$/MWh	\$/MWh
CO2	3.17	2.29	1.91
NOx	14.25	6.50	3.50
SO2	5.31	2.01	0.54
Total	22.73	10.80	5.95



Comparisons

Montgomery County paid the equivalent of \$10,000/ton for creditable NOx reductions

Alternatives including diesel bus retrofits car pooling incentives etc. cost \$20,000 to \$30,000 / ton for creditable NOx reductions

The Total Emissions Credit may be worth more than the value of a REC

Crediting Avoided Emissions

- ◆ If properly quantified avoided emissions from wind power and other renewable energy are REAL and are creditable as emissions reductions for regulatory purposes.
- ◆ At present procedures for SIP credit are only available for NO_x in cap and trade states with a renewable energy allowance set-aside. EPA has issued a SIP guidance document for this situation
- ◆ The detailed procedures for quantifying NO_x reductions and allowing them to be credited are now being worked out by EPA and a few states.
- ◆ Environmental Resources Trust is preparing model documentation for the DOE Wind Powering America Program.

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